

## Executive Summary

This report summarizes the findings of part 1 of the Urban Streams Non-Point Source (NPS) Assessments in Maine project, or Urban Streams Project, which investigated impacts of urban NPS pollution on four small streams in Maine, USA. The final goal (part 2) of the project is the development of NPS Total Maximum Daily Load (TMDL) plans aimed at removing or alleviating the impacts, and allowing impaired macroinvertebrate communities to recover and meet applicable water quality standards. The streams included in the project are Birch Stream in Bangor (central Maine), Trout Brook in Cape Elizabeth and South Portland, Barberry Creek in South Portland, and Capisic Brook in Portland (southern Maine). All streams are of moderate length (<1 to 2.5 miles) and watershed size (760 to 1,900 acres), and are located in highly urbanized areas. They have a fairly high percentage of impervious surfaces (13 to 33 %), and are impacted by a variety of urban stressors including high and low density residential development, commercial development, industry, and an extensive transportation infrastructure (roads, railroad, airport). Under Maine's Water Classification Program (Title 38 MRSA Art. 4-A), Birch Stream in Bangor and the Cape Elizabeth portion of Trout Brook are Class B waterbodies, while the South Portland and Portland streams are Class C.

The four streams were chosen for inclusion in this project because existing data collected by the Maine Department of Environmental Protection (MDEP) and the University of Maine at Orono (Morse 2001) indicated that biological communities (macroinvertebrates) and water quality (dissolved oxygen, temperature, nutrient, and toxic levels) were impaired. Based on data collected by the MDEP's Biological Monitoring Program between 1996 and 2001, all streams were included in Maine's 2002 305(b) list (MDEP 2002d) because of aquatic life violations of State Water Quality Standards. So as to identify potential stressors causing the impairments, a large amount of data were collected in part 1 of the Urban Streams Project:

- 1) Biological data: detailed analyses of macroinvertebrate communities in the streams as well as identification of fish species present, and detailed analyses of algal communities; identification of macroinvertebrates and detailed analyses of algal communities in wetlands connected to the streams (where present).
- 2) Water quality data: dissolved oxygen, temperature, conductivity, pH, turbidity; nutrients (forms of nitrogen and phosphorus), Chlorophyll *a*, total and dissolved organic carbon, total dissolved and suspended sediment, toxicants (metals, chloride, diesel range organics), and ions.
- 3) Habitat assessments: stream width and depth, flow velocities; large woody debris analyses; channel, watershed and stream habitat assessments; fluvial geomorphology study; determination of spill and combined sewer overflow (CSO) event occurrence.

Most of the data were collected at distinct locations (stations) on each stream, and not all data were collected at each station. There were two main stations on Birch Stream (middle and downstream), two on Trout Brook (upstream and downstream), one on Barberry Creek (middle), and two on Capisic Brook (upstream and downstream). Following data collection, the EPA Stressor Identification (SI) protocol (USEPA 2000a) was applied to each data set to identify

stressors affecting each stream. Ratings assigned to each stressor considered in each stream are shown in Table 1. An assessment of the utility of the SI process is presented in App. H of the report.

Table 1. Ratings for urban stressors at stream stations. “High importance” ratings are highlighted. Note that ratings reflect situation in each stream, i.e., are not necessarily consistent among streams.

<b>Stressor</b>	<b>Birch Stream (both stations)</b>	<b>Trout Brook (both stations)</b>	<b>Barberry Creek (single station)</b>	<b>Capisic Brook (downstream)</b>
Toxicants	H (7 +)	U, D: H (7 +)	H (10 +)	M (3 +)
Propylene Glycol	H (7 +)	--	--	--
Degraded habitat – in-stream	--	U: M (5 +) D: 0 (0 +)	H (9 +)	H (5 +)
Degraded habitat – riparian	--	U: 0 (0 +) D: M/L (3 +)	--	--
Increased sedimentation	--	U, D: 0 (0 +)	H (7 +)	--
Altered Hydrology	M (5 +) (peak flow only)	U: M/L (4 +) D: L (2 +)	L (3 +) (low flow only)	H (5 +)
Low dissolved oxygen	0 (1 +)	U: M/L (4 +) D: 0 (0 +)	--	L (2 +)
Elevated water temperature	M (5 +)	--	--	M (3 +)
Elevated nutrients	M (5 +)	--	--	M (3 +)

H, high importance; M, medium importance; L, low importance; 0, not important; --, not rated because not considered a stressor. Number in brackets gives the number of “+” assigned during SI process, i.e., positive evidence that stressor is affecting macroinvertebrate community.  
Trout Brook: U, upstream; D, downstream.

Toxicants were rated as the top stressor in three out of the four streams, and as a major stressor in the fourth. Other stressors receiving high ratings in individual streams were propylene glycol (deicer used at Birch Stream), degraded in-stream habitat, increased sedimentation, and altered hydrology. Although the stressors are ranked in their importance, all stressors are linked to a certain extent and their effects connected, making it difficult to apply a ranking scale. Nearly all sources for the stressors (e.g., high percent of impervious surfaces, railroad/airport operations, road runoff, input of winter road sand/road dirt, spills and dumping, CSO input, channelization) were linked to urbanization although a few natural sources of stressors were detected also (e.g., saltwater intrusion into stream channel, low gradient, low-DO groundwater input, naturally sandy/silty substrate).

Recommendations made in the report for Best Management Practices (BMPs) and remedial actions aimed at removing stressors, or alleviating their effects, included both structural (e.g., dry/wet ponds, infiltration trenches/beds/basins, driveway drainage strips, oil/water

separators) and non-structural (general “good housekeeping” practices) measures as well as activities such as replanting of the riparian zone, channel restoration, CSO separation, and outreach efforts. A summary of the identified stressors, BMP goals, and recommended structural/non-structural BMPs is presented in App. I of the report. The TMDLs to be developed in part 2 of the project will take the recommendations into account, and determine actions necessary for restoring water and habitat quality in these streams to a level that promotes Class B or C macroinvertebrate communities.

Copies of the full report including appendices can be found on the MDEP website ([www.state.me.us/dep/blwq/docmonitoring/stream/index.htm](http://www.state.me.us/dep/blwq/docmonitoring/stream/index.htm)). The report is broken down into individual chapters (Ch. 1 Introduction, Ch. 2 Methods, Ch. 3 Birch Stream, Ch. 4 Trout Brook, Ch. 5 Barberry Creek, Ch. 6 Capisic Brook) and a series of appendices, which can be downloaded individually. Note that documents included in Appendix A are available on request from [biome@maine.gov](mailto:biome@maine.gov) or 207/287-3901.